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The Lymphatic System in Relation to General Veterinary Practice

DISCUSSION BY THE CENTRAL VETERINARY SOCIETY*

Mr. C. W. OTTAWAY: The lymphatic system consists of lymphoid tissue and lymph channels. Lymphoid tissue, *i.e.*, lymph cells plus connective tissue, is present in the body in a variety of forms. In its most highly organised state it consists of encapsulated collections of densely packed cells—the lymph node or gland; but many areas of the body contain masses of lymphoid tissue in a less organised state which are nevertheless of great importance. There are, for instance, the Peyer's patches of the intestine. Then there are the diffuse areas of lymphoid tissue present in the submucosa of the intestinal, respiratory and reproductory tracts which may become enlarged in disease. In addition there are organs—thymus, tonsil and spleen—which form an integral part of the system. Lymph channels consist of spaces, vessels and sinuses which serve to convey lymph throughout the system and eventually into the blood stream.

It should be stressed that this system is part of the general circulatory system. Lymph vessels run in close proximity to blood vessels. There are anastomoses between lymph and blood tracts; and ultimately, via the thoracic or other major ducts, the contents of the lymphatic pathways are drained into the great venous trunks entering the heart. This intimate association must be considered in all questions relative to haematogenous as opposed to lymphogenous spread of disease. It is not a question of the accessibility of anatomical pathways as both systems are present almost everywhere and it is as easy for an invading organism to gain entrance to either. It would appear that the route chosen by the invading organism is the one which offers the least resistance to its progress. It may be that some infections are spread by both systems; but only in the one, the lymphatic, which is the weaker and has specialised centres of resistance, are macroscopic lesions evident.

Lymph vessels lead into or out of nodes and the direction of lymph flow is dictated by the presence of valves. Vessels may be zoned as peripheral, intermediary or central in position. In the cutaneous zone anastomoses and networks are plentiful and valves few. It would appear, therefore, that there is no set direction of movement until the lymph reaches the deeper intermediary vessels, which are straighter, less tortuous and contain more valves. Even in the intermediary zone the flow may not always be central. It is possible, for example, to find adjacent vessels with valves set in opposite directions, and vessels are seen to miss a node which would appear to be on their course. Once in the central zone, lymph is conveyed as a rule by the shortest route to the great venous channels entering the right atrium. Therefore, although it can be said that the general flow is towards the heart, it must be remembered that there are normal factors which may influence the direct nature of this course.

Nodes vary in number, relative size and position in the different species and even in the individual animal. This could be discussed at great length; but the most careful analysis would not detract from the realisation that basically the system is the same in every animal. For example, although there are more nodes in the horse than in the ox, it is easy to see that a cluster of small nodes in the horse corresponds with a single large node in the ox. Histological evidence will support this; the trabecular network of the node in the ox is well developed and tends to separate completely cortical nodes and their sinuses, as though they were in fact separate nodes. (This introduces the question of selective areas of drainage within a node.) Whatever the particular plan, it will be found that, apart from in the limbs, nodes tend to be arranged in groups with main vessels connecting to the next group. Each region has a major node into which most of the lymph will eventually pass before going on to the next regional group. If this node is the last before the blood stream is reached it is known as a terminal node. The exact boundaries of an area drained by a particular group of nodes, and the major node of groups, will vary with the species, but it is perfectly easy to follow and the basic plan never varies. This point is of value in meat inspection. Nodes are situated along the course of blood vessels, commonly at the bifurcation of main arteries or veins. Except for a small node in the region of the hock in the pig, there are none below the level of either the elbow or stifle regions in any of the domestic animals.

A lymph node consists of two parts, a cortex and a medulla. In the cortex the cells are aggregated to form nodules, in the medulla they are more loosely and less regularly arranged. Septa or trabeculae penetrate the gland from the capsule. In the cortex these septa tend to separate the nodules; in the medulla they have no definite course. Apart from these septa the whole node is beset with a framework of reticular fibres, rich in reticulo-endothelial cells—most active phagocytes. Between the capsule and the cortex is the cortical sinus into which the afferent lymph vessels enter. This sinus is connected with the sinuses in the medulla by small channels. The efferent vessels arise from the medullary sinuses and leave at the hilum. Thus, although lymph may enter from any direction, it leaves at one point only—a bottle neck effect. This sketchy histological account is given as a reminder of the antibacterial properties of a node. It will be seen that an invading organism within the lymph stream has to contend not only with a mechanical barrier in its passage through a node, but also with the activities of the cells of the reticulo-endothelial system.

Another lymphatic function is to provide pathways for the transport of fat and drainage of the tissue juice. Tissue fluid is formed in the spaces and it accumulates substances, the aftermath of the metabolic process, which are not readily absorbed by the venous system. They are, therefore, taken up by the lymph stream and conveyed therein to the larger venous trunks. This activity is dependent upon normal blood pressure, normal permeability of the capillary walls and the normal composition of three body fluids: blood plasma, capillary filtrate and lymph. Any departure from this normality may be associated with a factor of great clinical significance—oedema.

May I be permitted to introduce a little embryology and ideology for a moment in order to discuss these two major functions of the system: metabolic and antibacterial. If the development of the system is considered, it will be seen that first structures to appear are the vessels. Later, at the site of the future node, tufts of vessels arranged not unlike the glomerulus of a kidney appear. Around this meshwork of vessels and sinuses the lymph node is eventually formed. This procedure continues after birth, possibly even late in life. One could imagine, therefore, that nature ordained this system pre-eminently for drainage in health; and only as an afterthought did she realise that these pathways which carry the products of metabolism could just as easily carry the forces of destruction. So she introduced the nodes at strategic points to resist the invader. On this reckoning, little wonder that the nodes become involved in, say, an acute inflammatory process, as the vessels provide an excellent medium for the rapid transport to them of the organism. As against this it might be argued many vertebrates, *e.g.*, the chicken, have but few areas of lymphoid tissue along the course of vessels, yet they appear to get along very well without them. This example does, however, endorse the argument that the lymphatic system has two distinct functions. The practitioner must always be concerned with both; but apart from a few specific diseases it is probable that he will be more concerned with metabolic irregularities, and all that that implies, than with inflammatory reactions in lymph nodes.

Of what value to the practitioner in the normal pursuit of his duties is a detailed knowledge of the lymphatic systems? Personally, I feel it would be of little value. All that is required is a knowledge of the normal plan of drainage, of the regional distribution of nodes and of the position of the major and the terminal nodes. If the lymphatics themselves are diseased there is no need to memorise the precise position of structures; they can be felt and seen (*e.g.*, pseudo-Hodgkin's disease, "Monday morning leg"). On the other hand, with metastatic conditions a knowledge of the probable route of spread is of extreme value. Further study will only introduce such questions as: alternative drainage routes, that structures are not always where they ought to be, that more or fewer nodes are present than the book states, that the easiest way to explain lesions in two distant areas of the body is either that the organism went round the body several times before it formed a macroscopic lesion, or that there were two primary sites of invasion.

*At the meeting held at the Conway Hall, London, W.C.1, April 5th, 1945.

Finally, further study would introduce that awful bugbear of anatomy, variety of nomenclature, which will confuse even the most earnest student. I am prepared to believe that it is possible for an organism to enter the body at point A and to travel via the lymph stream to point B, yet it would be impossible to state categorically which route it took.

The connection, if any, between the comparative lymphatic patterns and the spread of disease is a matter of conjecture. I have tried to work out an association between the two but without much success, *e.g.*, is the presence of an extra cervical lymphatic pathway in the pig associated with the generalised spread of tuberculosis in that animal? Again, it is said a group of small nodes—such as are present in the horse—affords a more effective barrier to the spread of infection than does a single large node—the common type in the ox. Can we say, on this score, that lymph-borne infections are more common in the ox than in the horse? The long chain of Peyer's patches in the intestine of the calf—does this form a more protective barrier to the spread of intestinal infection in this animal? In this connection it is interesting to note that all animals have but one node—the mesenteric—between the vessels which drain the intestines and the thoracic duct which promptly drains into the blood stream. It would be rational to suggest that an intestinal lymph-borne infection would rapidly become blood borne. Does this occur? Does the mesenteric node form a 100 per cent. barrier, or is it that the invading organisms do reach the blood stream and are quickly destroyed? There are many other such examples which could be quoted, but on this controversial note I will leave this brief anatomical survey.

In conclusion, if anyone here would say, "If only we knew more about the lymphatic system of such and such an animal or region we should know more about such and such a disease," let him speak up. There is no limit to the field of anatomical research.

Dr. E. G. White: Few lymph nodes can be palpated during life and lymph vessels are not demonstrable clinically unless they are diseased. Thus the main importance of the lymphatic system to the practitioner lies in its involvement in disease, including various inflammatory processes, neoplasia, and lymphoedema. With the exception of diseases which primarily affect lymphoid tissue, such as leukosis, the lymphatic system becomes involved in disease through the lymph which reaches it from the tissues. Bacteria, viruses, certain parasites and tumour cells readily enter lymph and are carried to the local lymph nodes. If not successfully dealt with there the infective agents or tumour cells are led from one lymph node to another and eventually enter the blood stream. Thus the lymphatic system is an important route for the dissemination of disease within the body.

The lesions which occur in lymph nodes may provide useful information as to the nature of a disease process, its site of origin and its method of spread. Bacteriological examination of lymph nodes is useful for demonstrating infective agents which may be less easily found at the primary site of infection. Thus, bacteria may be obtained in pure culture, and tumour growth free from the secondary changes caused by ulceration and secondary infection. Excision of lymph nodes in living animals may be useful since histological or bacteriological examination may help in diagnosing disease. Exploratory puncture, too, may provide valuable material. At autopsy, it is always advisable to include the regional lymph nodes when submitting material to a laboratory for histological or bacteriological examination, since it is often possible to isolate pathogenic organisms from lymph nodes when *post-mortem* changes make it difficult to do so directly from the diseased organs or tissue.

While clinical examination of lymph nodes is useful, one cannot assume that the absence of gross swelling or induration necessarily indicates freedom from disease of the organ drained by those nodes. Thus in the common form of chronic tuberculous mastitis in cattle the supramammary lymph nodes may be clinically normal and even when examined *post mortem* they may show no obvious gross tuberculous changes. Conversely, enlargement of nodes draining an area in which there is a primary tumour does not necessarily indicate secondary tumour deposits. Lymph node enlargement in such cases may be due to ulceration or bacterial infection of the tumour. Similarly, in bacterial infections, the local nodes, although enlarged, may fail to show the infective agent, enlargement being non-specific and perhaps due to local tissue destruction and absorption of the products of tissue breakdown.

Sometimes, in cases of neoplasia, the local lymph node develops large secondary deposits when the primary growth is still small and difficult to detect, *e.g.*, some cases of tonsil carcinoma in the dog.

Oedema (accumulation of fluid in the tissue spaces and serous cavities) may be local or general in distribution. The main factors concerned in regulating the fluid exchange between the blood capillaries, the tissue spaces and the lymphatic vessels are: (1) The capillary blood pressure. (2) The permeability of the capillary walls. (3) The colloid osmotic pressure of the plasma proteins. (4) Lymphatic drainage. One or more of these factors is concerned in the production of the various forms of oedema. It is now known that there occurs normally some loss of plasma protein through capillary walls into the tissues. This protein is probably largely absorbed by the lymphatics and returned to the blood. Protein which enters the tissue spaces is absorbed almost entirely by the lymphatics and this is a slow process and is aided by muscular movements and massage, *e.g.*, compare the absorption of saline and of serum injected subcutaneously, the former being rapid and aided by rest, the latter slow and aided by massage.

Inflammatory oedema.—The swelling which occurs in inflamed tissues is due to flooding of the tissues with an exudate rich in protein and containing red cells, the irritant agents, cell débris and soluble products of tissue destruction. If the inflamed area communicates with a free surface some of the fluid is discharged and there is a loss of valuable protein from the body. If the area is enclosed the exudate is slowly absorbed by the lymphatics. The rate of absorption is lessened because of restricted movement of the inflamed part and fibrin deposition. If the exudate remains there occurs fibroblast proliferation. If the inflamed area is an infected wound the logical treatment includes: (1) Elevation of the part and immobilisation—to reduce the venous pressure and lessen exudation. (2) Surgical removal of dead and dying tissue—to reduce exudation and reproduce the conditions for healing which exist in a clean incised wound. The closed plaster technique, after débridement, fulfils just these requirements. If there has been fluid loss from the wound the giving of plasma is also indicated.

Circulatory oedema is due to venous congestion and the fluid which collects in the tissues is poor in protein and its position is influenced by gravity. The oedema is caused by the raised venous and capillary pressure and by anoxaemia. There is no collapse of lymph vessels in oedema and they are in fact held wide open; that they do not carry away the excess fluid is due to the fact that there is no additional propulsive force available to transport the fluid along them, in fact there is often less muscular movement than normally and so lymphatic drainage is actually diminished.

Renal oedema.—This type of oedema is common in man but seems not to occur in animals.

Nutritional oedema.—This includes oedema occurring in wasting diseases such as tuberculosis, Johne's disease, or parasitic infestations, starvation due to lack of food or interference with food intake, and the oedema seen in severe anaemia. The factors concerned in producing this type of oedema are lowered plasma proteins and changes in the vascular endothelium leading to increased permeability.

Lymphatic oedema.—Mere lymphatic obstruction does not always produce oedema, *e.g.*, ligature of the thoracic duct may cause only temporary lymph stasis, followed by the establishment of collateral drainage of lymph into the venous system. Cases of chylous ascites and chylothorax in the cat may be the result of obstruction of the thoracic duct. To produce lymphoedema it is necessary to provoke chronic inflammatory changes in lymphatic vessels, *e.g.*, experimentally in the dog's leg by injections of silica and quinine, or naturally in man by filariasis.

It is worth remembering that there is very little lymph flow from a limb at rest, but that the flow is greatly increased by muscular movements or by massage. Also that infection may travel rapidly along lymphatics in which lymph is almost stationary.

The Cells of Lymph.—In its passage through lymph nodes the cell count of lymph rises from a few hundred cells per cubic millimetre to 40,000 or so, when it reaches the blood stream. Some 200,000,000 lymphocytes enter the blood through the lymph every hour and yet the level of blood lymphocytes remains constant, except for regular diurnal variations. What happens to these cells is still a mystery. Probably not more than 3 per cent. re-enter the tissues and are returned to the lymph. A proportion pass through the mucosa of the gut and are lost. Some probably disintegrate in the circulating blood. It has been suggested that a large proportion are filtered out in the bone marrow and there serve as precursors for various other types of cell. If lymphocytes do not give rise to other types of cell it is difficult to know what useful function they perform. They can move but are almost non-phagocytic; it is unlikely that they carry fat; and they have no marked enzyme activity.

Efficiency of Lymph Nodes as a Barrier.—Lymph nodes form a very efficient mechanical and biological barrier against inert particles and a variety of infective agents. With virulent organisms, however, the barrier may be ineffective and dissemination of the infective agent may occur. For example, vaccinia virus is transported within lymphocytes and these cells may act as carriers of the virus within the body. The virus of rinderpest when present in the blood is nearly all associated with the blood leucocytes. This suggests that lymphocytes may be of some importance in the dissemination of viruses in the body. Virus within lymphocytes is probably protected from the neutralising effect of antibodies. As an illustration of the variation in the efficiency of lymphoid tissue

the following experiment is instructive: pneumococci of a type which is very virulent for rabbits appeared in cervical lymph within one hour of nasal instillation; in the dog, for which these organisms are much less virulent, the organisms could not be detected in cervical lymph at all. The following examples illustrate this point further and are given in the hope that they may provoke some discussion.

1. *Injection of milk containing bovine tubercle bacilli into the thigh of a guinea-pig.*—Most milk samples contain other organisms as well as tubercle bacilli: the former are mainly dealt with at the site of injection and in the first regional lymph node. Tubercle bacilli, on the other hand, pass through the whole series of lymph nodes, in which tuberculous lesions develop, enter the blood and produce haematogenous infection. The regional lymph nodes in such an animal have dealt successfully with the bacteria of low virulence but have failed to hold up the virulent and ultimately lethal tubercle bacilli. It seems that a necessary price to be paid for lymphatic drainage from tissues is the risk of transport of bacteria or other noxious substances to lymph nodes where, if their virulence is high, they may succeed in gaining the blood stream in large numbers, although successfully resisted at the primary site of disease, and in the blood stream if they reach it in *small* numbers.

2. *Carcinoma.*—Carcinoma cells readily enter lymphatic vessels and spread by embolism and permeation and finally reach the blood stream, whereas at the primary site of the tumour direct entry of tumour cells into blood vessels may be successfully resisted for longer. There is no doubt that the lymphatic system forms a ready means of dissemination of cancer cells.

These examples show that the protection afforded by lymph nodes is sometimes incomplete and, in the case of some viruses, may be very slight. In general, it seems that the *lymph nodes* are useful barriers to infection but may also serve as portals of entry, *e.g.*, the tonsils in tuberculosis, anthrax (pig), streptococcal infections (dog). Thus, expressing the extreme view, Dunker and Yoffey ("Lymphatics, Lymph and Tissue Fluids," 1941, p. 175) state: "Any barrier action of the lymph nodes is more than offset by the dangerously rapid extension of disease that lymphatic vessels render possible." The *drainage of lymph* from the tissues is of great importance, particularly in exercise and in inflammation or whenever fluid rich in protein accumulates in the tissue spaces.

A final point of some practical interest is that antisera given intravenously give a lower antibody level in the lymph than in the blood and so organisms within the lymphatic system may survive and re-establish blood infection later. In contrast, sulphanilamide readily passes into tissue fluids and lymph and exerts its antibacterial effects throughout the tissues.

Mr. D. N. Spriggs: The large-animal practitioner finds pathological changes in, or arising from, the lymphatic system, as a very common occurrence on his daily rounds. In general, the cases can be divided into two main classes: (1) Enlargement of one or more lymphatic glands, due to endogenous or exogenous infection. (2) Local or general oedematous changes.

In many cases, these two sets of conditions appear simultaneously.

Dealing with bacterial infections first, the onset of symptoms and lesions may be sudden or gradual. The primary function of the lymph nodes is the extraction of foreign material out of the lymph, which is on its way from the tissue spaces to the blood stream. This filtration of foreign particles, consisting largely of bacterial bodies or their products, is accomplished by mechanical means and by the phagocytic activity of the reticulo-endothelial cells. The primary result of a bacterial invasion in any part of the body is the congestion and enlargement of the local lymphatic glands draining that particular part. The rate of increase in their volume will vary tremendously according to the nature of the micro-organism involved, and the rapidity or otherwise of such changes may be a useful guide in differential diagnosis, *e.g.*, in the supramammary glands to distinguish a streptococcal or staphylococcal mastitis from tuberculosis of the udder. The macroscopic appearance of the lymph nodes is also of great diagnostic value, *e.g.*, the diffusely reddened and swollen glands found in acute cases of swine fever and in anthrax.

In the living animal, the clinical appreciation of the enlarged and indurated lymph nodes is usually confined to the more superficially placed organs, namely, the prescapular, popliteal, and supramammary glands, together with those of the head and neck. I have, however, on rare occasions percepted an appreciable increase in size of the external and internal iliac glands per rectum, and in indefinite but suspected cases of tuberculosis, for instance, this method would seem worthy of trial.

The involvement of the glands solely in the anterior, cervical and submaxillary regions in cattle can for all practical purposes be resolved into the differential diagnosis between tuberculosis and actinobacillosis. Usually, the relatively sudden onset, and often co-existent lesions in the tongue and neighbouring soft organs, together with some oedema in the submaxillary space, suffice to establish a diagnosis of wooden-tongue. In doubtful cases, if there is no apparent response to the intravenous injection of 1 to 1½ oz. sodium iodide in 12 oz. water, tuberculous infection is almost certain. It would be of great interest to know the action of iodides in actinobacillosis and whether they are a specific against the invading bacterium or have a more general beneficial effect on the lymphatic network in addition. If the latter, the drugs should prove of benefit in some of the more general manifestations of lymphatic upset, to be discussed later.

The second condition which may result from a derangement of the lymphatic system is that of oedema or dropsy, which may be defined as abnormal accumulation of lymph in the body tissues or cavities. Lymph has been described as the middle-man between the blood and the tissues, and the overflow of lymph is removed from the tissue interstices by the lymph vessels. Now oedematous conditions are encountered very frequently in general veterinary practice, and it is apposite, therefore, to consider their aetiological basis. The abnormal accumulation of fluid in the tissue-spaces is a sequel to one of the following:—

(*a*) An increased blood pressure due to a physiological or pathological vascularity of the tissue or organ.

(*b*) Inadequate absorption of the tissue fluids due to some obstruction in the lymphatic or venous system by tumours, tuberculous or other lesions, etc.

(*c*) An increased permeability of the blood vessels.

(*d*) An increased filtrability of the blood.

From a prognostic angle, it is necessary to demarcate the curable oedematous conditions from the incurable. For instance, in aged dogs and cats showing ascites and/or a generalised anasarca, it is probable that irreversible cardiac or hepatic changes are the root of the trouble and all that can be done for the animal is the temporary alleviation of the acute symptoms by appropriate paracentesis and palliative means. In certain debilitating diseases, *e.g.*, tuberculosis, multiple malignant neoplasia, distomatosis, parasitic pneumonia and gastro-enteritis, what is known as cachectic or hydraemic oedema may arise. It is thought that several factors are responsible—the anaemic quality of the blood, the toxic damage to the capillary walls and possibly variations in osmotic pressure due to the presence of toxins in the blood. For the rational treatment of these cases one has first of all to assess the fundamental cause or causes, but as a rule the generalised anasarcous condition is one of the last of a long series of pathological changes and slaughter is the only course.

The state of affairs in localised oedema, however, is quite different. The fluid accumulates in the subcutaneous tissues comparatively rapidly and may appear in any part of the body. Perhaps the commonest site in cattle is on and around the udder. This mammary oedema is seen very frequently at the time of parturition and may be considered almost physiological in heifers of high milking potentialities calving down for the first time. The condition is affectionately known to herdsmen as "nature in the bag" or "jugginess," and is regarded as a sign of a very good milker. Whilst the oedematous swelling of the udder and lower abdomen usually subsides within a week, it may persist in some animals for a month or more and be the cause of a considerable loss of milk during this time. It is, therefore, of great economic importance to reduce this "jugginess" as soon as possible. What can we do about it? Let us consider the factors involved.

A sudden increase in the blood supply to the udder at the onset of lactation is not fully balanced by a corresponding drainage through the venous and lymphatic channels. In some heifers, in fact, small amounts of blood are actually secreted in the milk for a few days and are nothing to worry about. The flow in the lymph vessels is controlled by the difference in pressure at the two ends of the lymph system, by the massaging effects of muscular movements, and by the presence of valves. The vessels have very thin walls and thus any outside pressure, such as that produced by the contraction of skeletal or visceral muscle will tend to force lymph towards the heart, backflow being prevented by the valves. The lymph flow towards the thorax is further augmented during inspiration by the backward movement of the diaphragm, which increases abdominal pressure. Thus our advice to the farmer will be—plenty of massage to the udder, with gentle exercise to the animal daily. But should one apply hot fomentations or cold compresses to reduce the oedema? Ought one to strip the milk out completely or not? And do we advise feeding for maximum milk production, or go easy on a starchy laxative diet for a few weeks? I should be glad of Dr. White's opinion on these questions from a physiological standpoint, and would welcome practitioners' experiences in combating the condition.

The beneficial effects of exercise and massage are also seen in the well-known condition of sporadic lymphangitis or "Monday morning disease" in the horse. This condition is said to be more common in gummy-legged heavy draught animals. The actual cause is unknown but its incidence is materially lessened by exercising the horse daily for a short period during his normal resting period,

i.e., at the week-end, and by cutting down the nitrogenous part of the diet at these times. On analogy, these would seem to be important points to remember in the treatment of other oedematous conditions.

The symptoms exhibited in lymphangitis are much more acute and painful than in simple oedema. An inflammation is set up along the course of the local lymphatic stream in addition to the enlargement of the inguinal glands and sometimes glairy lymph is seen exuding through the skin. The whole syndrome is obviously of constitutional or metabolic origin and must be treated as such.

Pain may also be evinced in cases of inflammatory oedema which frequently develops around the site of traumatic injury. In these cases, after appropriate steps have been taken to remedy the inflammatory reaction, the surrounding lymph extravasation will disappear of its own accord in due course. Gentle digital massage in an upward direction (against the pull of gravity) will assist in the dispersal of fluid, and laxatives by mouth are indicated.

A few days ago, after I had given a calcium injection into the jugular vein against milk fever, an oedematous swelling developed in the cow's submaxillary space, well above the site of the injection; it disappeared in a couple of days and was of no real consequence. The point at issue is—how did it arise? Presumably some slight obstruction was set up in the jugular by the injection, causing an increased venous pressure and an outpouring of lymph into the tissue spaces above. It was observed at the time, and has been seen on other occasions, that the jugular vein became widened and very taut during the administration of the calcium borogluconate, and it is quite certain that none of the fluid escaped subcutaneously. The moral would seem to be—inject the drug slowly using some apparatus like the fluttervalve for the purpose, and if alarming venous pressure ensues, inject the rest subcutaneously.

In general practice one occasionally encounters an inflammatory-cum-oedematous enlargement in the throat regions of sudden onset and of unknown origin. Whilst somewhat alarming at the time, the swelling soon subsides and causes the heifer or cow little inconvenience. It would be interesting to ascertain the true nature of this type of case.

There is just one further affection of the lymphatic system to which I would draw your attention to-day and that is granular vulvitis, or vaginitis as it is usually erroneously referred to, in cattle. This condition is characterised by the engorgement and inflammation of the lymphoid follicles found normally in the bovine vulva, often in combination with a diffuse reddening of the intervening mucous membrane and sometimes associated with a slight mucopurulent vulvo-vaginal discharge. It can be brought on quite readily by careless vaginal douching, particularly if irritant substances are used, and also by the introduction of a speculum for purposes of insemination or infertility control. This granular vaginitis has a very wide incidence and can be seen equally as frequently in herds where the conception rate is high as in herds where infertility is rife. In the vast majority of cases, in my opinion, the condition is of no practical significance, and its diagnosis is very often a retreat for the uninitiated. The presence of lymphoid follicles in the vulvo-vagina is probably to aid in preventing contamination of the genital tract by extraneous matter.

Mr. W. M. Henderson: My contribution to this afternoon's discussion is somewhat limited as for the most part my consideration of the lymphatic system is confined to the lymphatic drainage of the skin of the neck of the ox. In the course of our work at Pirbright one aspect of a problem in the production of active immunity has been an examination of some of the routes by which a vaccine can be given. Our attention was drawn to intracutaneous injection following various reports of better results having been obtained when this route was selected for vaccination against rinderpest, equine encephalomyelitis and brucellosis, where Besredka's thesis of local immunity would not necessarily apply.

In spite of the frequent use of the intracutaneous, or, as it is usually termed, the intradermal route, there did not appear to be much knowledge of the fundamental processes involved when an inoculum was introduced into the skin. A considerable amount of experimental work has therefore been done on this point.

It very soon became apparent that an intracutaneous injection was almost entirely an intralymphatic injection and the bulk of the inoculum injected was very rapidly drained by the lymph vessels to the regional lymph gland. One interesting point is that this is as true of particulate suspensions as solutions, the reason being that the skin contains a very rich lymphatic plexus which is damaged when the intracutaneous injection is made, thus enabling the inoculum to flow into the torn vessels instead of having to be absorbed through the walls.

A brief description of the way in which I have studied the rate of absorption may be of interest. Using Devon steers that had to be slaughtered for other reasons, some easily detectable substance such as trypan blue or india ink was injected intracutaneously in the side of the neck, the animal was then shot and the prescapular lymph gland of that side was immediately removed and examined for the presence of the inoculum.

The inoculum can usually be detected in the lymph gland within 60 seconds of the commencement of the injection. This was first observed using a dose of 5 c.c. and it was thought that this might be due to the pressure of 5 c.c. of liquid in the skin. Repeated observations have been made, however, with doses of $\frac{1}{2}$ c.c. and 1/10 c.c.

The following results are typical:—

0·5 c.c. 1 per cent. solution trypan blue, 8 inches from gland: 27, 29, 40, 52 seconds.—Negative. 54, 60, 67, 71, 79, 80, etc.—Positive.

0·5 c.c. staphylococcal suspension: 74 seconds.—Positive.

0·5 c.c. blood plus crystal violet: 31 seconds.—Positive.

5 c.c. olive oil: 8 minutes.—Positive.

0·5 c.c. olive oil: 16 minutes.—Positive.

The results obtained with 1/10 c.c. india ink are of considerable interest:—

Injected 8 inches from gland: 27 seconds.—Negative. 40 seconds.—Trace. 47, 53, 58 seconds, etc.—Positive.

Injected 14 inches from gland: 48, 55, 120 seconds.—Positive.

[Mr. Henderson here showed a preserved specimen—the skin and adjacent lymphatic gland of an animal in which an intracutaneous injection had been made of a solution of trypan blue.]

The extent of involvement of the gland is considerable, as the specimen shows. How much is trapped by the gland depends on the nature of the inoculum; particulate matter is largely removed from the circulation by mechanical filtration in the first lymph gland reached, whereas solutions pass through to the efferent vessel and eventually reach the blood stream. It will be realised that this is a general statement and interpretation must be qualified by consideration of the size of the particle and by consideration of any biological activity of the cells with which the inoculum comes in contact.

The results of these experiments quite naturally raise the question of what happens when you inject 1/10 c.c. of tuberculin? I am almost certain, and I hope soon to produce definite proof, that although some of the tuberculin probably remains fixed by the sensitized cells of a reactor at the site of injection, the bulk of the inoculum will have reached the lymph gland in a matter of seconds, where mere mechanical filtration will not remove it from the circulation. An interesting point in this connection is that examinations that I have made of the prescapular lymph gland on the injected side at the 48th hour have invariably shown it to be enlarged in the case of reactors.

There is another aspect of the lymphatic system that requires mention in this discussion and that is its role in the production of immunity; only very brief mention can be made of this fascinating and complex subject, and I shall limit my remarks to consideration of the production of antibodies. There are many indications that point to the fact that antibody production is a function of the cells of the reticulo-endothelial system. These cells are found in all regions of connective tissue but are particularly characteristic of those structures obviously designed to act as filters of unwanted material from the blood or lymph stream, namely, the liver, spleen, bone marrow and lymph nodes. There is now definite experimental proof that the lymph nodes are concerned in antibody production. The type of experiment in which this can be shown is usually performed in mice or rabbits. An antigen is injected intracutaneously into the ear; the lymphatic drainage of the skin of the ear is to a group of cervical lymph nodes. The antibody content of these nodes, the serum and the nodes draining the other ear is then determined at intervals after injection. Different workers have shown with a number of antigens that the antibody content of the nodes on the injected side is greater and is apparent earlier than at any other site. The advantage of using the ear is that it can be amputated after injection to rule out the possibility of local formation of antibodies in the skin at the site of injection.

I have already mentioned that intracutaneous vaccination was found to give better results with some conditions in the production of immunity than subcutaneous administration. It may well be that the rapid involvement of the regional lymph nodes following an intracutaneous injection may contribute to this better result by bringing the antigen in the vaccine into quicker contact, comparatively undiluted, with some of the cells responsible for antibody production. If the antigen is particulate it will remain at this site of antibody production while, if not trapped by the lymph gland, it will reach the blood stream to be dealt with by the spleen, liver and bone marrow.

(To be continued)

Prior to the first World War, Chicago horses ate 60,000 bushels of oats a day. Now 1,000 bushels per day is more than sufficient for such as still remain in the city, leaving 59,000 bushels for breakfast cereals.—*Vet. Med.*

THE VETERINARY RECORD

September 29th, 1945

THE SEVERAL INGREDIENTS AND THE PURPOSE OF A WELL CO-ORDINATED GENERAL VETERINARY DISCUSSION

THE purpose of a discussion, such as we publish in this issue, on " The lymphatic system in relation to general veterinary practice " can only be achieved if those who are responsible for planning it have borne clearly in mind the three ingredients named in that title and, in their choice of speakers and directions to those speakers, have apportioned those ingredients in such a way as to present the whole varied and difficult theme in a well-ordered, well-digested and well-knit manner. Clearly, no one individual could pretend to speak with any first-hand authority on the whole tneme.

To take the first of these ingredients, the Lymphatic System, great masses of knowledge have been steadily accumulating upon it for the last 150 years or so since the first striking pronouncement was made, in 1784, upon its part in the body by William, the anatomist brother of the great John, Hunter. Not many years ago it was proved to be a " closed " system, in the same sense approximately as the cardiovascular system is a " closed " system, the lymph traversing throughout the tissues within closed capillary vessels in a manner similar to the blood capillaries. The two sets of capillaries are about equally numerous and in most, but not all, tissues in very close apposition. The tissue fluids which bathe the body cells themselves, however, are neither, in the true sense, lymph nor blood plasma, but are affected in composition by a process of interchange of substances through the respective capillary walls, which process has been studied in great detail by the physiologist. It is upon the maintenance of those fluids bathing the cells in a state of constant composition that healthy cell metabolism depends. When any of a great number of injuries are brought about to disturb this process of interchange, we see set up what is known as oedema, in the many forms familiar to the veterinary practitioner. A great mass of knowledge has accumulated, too, upon the nature of those injuries, which produce the so-called lymphadenopathies, the study of which falls within the ever-broadening province of the pathologist, but in respect to many of them, such as the several well-known allergic reactions, also familiar to the practitioner (*e.g.*, the cutaneous tuberculin reaction), they have provided material for intensive study by a special group of workers, namely, immunologists. Nor does that exhaust the list of specialists who have taken the study of the system within their special purview. Long ago it was known that myxoedema was related somehow to thyroid deficiency, and so during the last 20 or 30 years, since the rapid rise in status of endocrinology, much that was previously obscure has become known about the control of interchange between the tissue fluids and the lymph on the one hand and the blood plasma on the other, not only by the iodine-containing thyroid secretion but also by the other endocrine secretions. Again, such matters as control through regulation of salt concentration in the fluids fall within the province of the chemist, or physicochemist.

Having regard to the variety of specialised workers engaged, in whole or in part, in advancing knowledge on the lymphatic system the task of presenting a well-digested review that would be both stimulating and helpful to the veterinary practitioner would therefore appear to be formidable.

Now, when we come to the second ingredient, the large array of disturbances to the lymphatic system seen by the veterinarian in the course of his practice, we soon perceive that the difficulty of composite presentation is no less formidable, but that, all the same, when a serious attempt is made to overcome that difficulty, information of the greatest possible importance to progress in knowledge soon emerges. Again, it is far beyond the capacity of any one veterinarian, however large his experience, to speak from first-hand knowledge on the whole field. In former days, when the horse was economically the most important domestic animal, veterinary practitioners were only too familiar with such conditions as sporadic lymphangitis (" weed "), the farcy lesions of glanders, ulcerative lymphangitis, and so on. Present-day canine and feline practitioners are abundantly familiar with such conditions as chylous ascites. Veterinarians in the home State service are on the alert for the lesions of such an alarming malady as foot-and-mouth disease, in which " lymph " rapidly accumulates in the well-known lesions in the mouth and on the feet. Or, in their endeavours to interpret the skin reactions in the intradermal tuberculin test they may be led beyond superficial observation of these reactions to a deeper study of their real nature. The tropical veterinarian, again with the far greater wealth and variety of morbid material to his hand, will be led, if he develops his interests, into, for example, a clearer understanding of the essential differences between the Babesia and Theileria infections of cattle, the former being essentially a " haemopathy," and the micro-parasite " erythrocytoclastic," and the latter a " lymphadenopathy " and the micro-parasite " lymphocytotropic."

Lastly, we come to the third ingredient, the Relationship between the above two ingredients—and the ingredient from which real profit is to be derived from such a discussion.

It is perfectly clear that nothing is to be gained from attempting to construct such a relationship unless the first and second ingredients mentioned above are set forth, with accuracy, with precision and, cerfainly on the part of the practitioners, with candour and enthusiasm. Can we trace any such possibilities of constructing a valid, or even probable, relationship from this Central Division discussion ? We believe we can, at several points, and it will suffice if for the present we give only one such point as an example, appreciating to the full that in what we are about to say there is, until it is put to proof, a considerable element of speculation. One of the speakers, with long and extensive knowledge in horse practice, said he pinned his faith to sodium iodide in the treatment of " weed." That may well be alleged to be entirely empirical—a " shot in the dark," as it were, and would perhaps be lightly dismissed as such by those who are not particularly gifted with powers of deep insight into veterinary problems. But so, we may say, have such well-proved treatments as quinine in malaria, digitalis in heart trouble, and, let us now here add particularly, iodine in actinomycosis been " shots in the dark " to begin with, and even now the persistent researches of laboratory workers have not told us clearly exactly how these remedies act.

Now, only a few weeks ago there appeared in *The Veterinary Record** a brief summary of some most significant work carried out by one of our veterinary colleagues in Uganda on the mechanism of *Trypanosoma congolense* infection in cattle. There it was shown that proliferation

* *Vet. Rec.*, **57**, 366.

of the parasite actually takes place only in the superficial capillaries underlying the skin, but the products of the damage caused, remotely, blocking, and abrasion of the lining, of the capillaries in all the deep-seated organs of the body including those most vital for the survival of the animal, such as the thyroid gland. Thus it was revealed that the oedema which is a constant symptom of the disease in adult cattle before it ends, as it does, almost invariably, fatally, is actually a myxoedema. The capillary linings of younger animals are able to respond effectively to the "insult," but those of older animals are unable to do so. All drugs tried, which have had as their aim the destruction of the micro-parasite, had shown themselves, in adults at any rate, worthless, for the parasite had already wrought its havoc when symptoms had become manifest. It is thus that some drugs, like the phenanthridinium series, may possibly exert their curative effect not so much by their direct action on the parasites (which has been shown to be a feeble one) but through their possessing the special property to restore the damaged linings of the lymph and blood capillaries to healthy structure and function.

Hence it follows that we may well find the clue to successful treatment in other ways than the orthodox chemotherapy which, deservedly, has come so much to the notice of practitioners recently with the advent of such drugs as the sulphonamides and penicillin. There the aim has been to obtain and exploit drugs that are endowed with the property of being most harmful and even lethal to the infecting micro-parasites, such as streptococci, and, at the same time, least harmful, but not necessarily helpful, to the host cells. That, we are now beginning to see clearly, is not the only way to get the upper hand in all diseases. Indeed, in some of them, and even in some caused by easily recognisable micro-parasites, it may be of no avail. Something different, where the objective is not so much the destruction of the parasite but succour to the body cells, appears in those diseases, at any rate, to be the rational and most promising mode of intervention.

There is really nothing novel in the idea, for, as an example, in the treatment of hookworm disease in man it has often been found to be better to resort, not to anthelmintic treatment (with carbon tetrachloride or oil of chenopodium), but to a treatment (as, with iron salts) which aims at enabling the patient himself to overcome the disturbing symptom of the infestation, which is anaemia. Practitioners hardly need to be prompted further to recall many similar conditions arising in the course of their work.

Withal, therefore, a discussion such as we now report merits the closest attention of practitioners, not only for the information which it gives but for, what is perhaps at least as important, the inspiration which it arouses.

Weekly Wisdom

"Avail yourself of those opportunities which the increasing intelligence of the age offers to all, remembering that, unless you advance with the spirit of progress by which those around you, in your own and other professions, are directed, you must necessarily go backwards."—From a Report on Cornish Farming, 1845.

as the one described, or with the surgical opening of the wall of a sac, for the reduction of the larger umbilical herniae, when a closed operation would not succeed; providing reasonable precautions are taken.

Appropriate after-treatment in the above cases demands—at least in the early stages of repair—that the amount of bulky food which our patients would consume shall be definitely lessened.

CLINICAL COMMUNICATION

Puncture of the Abdomen: Prolapse of Intestine

P. A. McCORRY, M.R.C.V.S.
Ballyconnell, Co. Cavan

The victim was a six-year-old draught mare with foal at foot. It is not known how the accident occurred, whether from staking on a fence or the thrust of a cow's horn; as, however, the mare had access to a cattle shed where these sheltered during an early August heat spell, it would seem that the latter was the probable cause of the injury.

The region was the right inguinal, rather more than a hand's breadth in front of the udder. The prolapse could be likened in size and shape to that of a nine-inch flower-pot turned upside down.

Assuming that descent of bowel began immediately after the injury, its exposure was probably not less than five or six hours at the time of my attendance.

It was an excellent specimen in giving a display of passive oedema with constant dripping of beads of serum from an uninjured surface.

The animal did not seem to suffer any discomfort.

Reduction.—Everything used in the operation including a few pocket handkerchiefs for swabs, was sterilised by boiling in a handy sized pot oven and conveyed in this from fire to field.

The mare was cast with side lines and the legs fully flexed and spread in a manner necessary for "rig" operations.

Three and a half ounces of chloroform was given, excluding air, which induced full anaesthesia in about seven minutes.

The prolapse, now considerably larger, due to a limited struggle in casting, was cleansed with tepid normal saline solution. No disinfectants were used throughout.

On examination the puncture was found to be circular in outline—it admitted just the gathered fingers and thumb of the hand. This opening would not admit the return of bowel and it was necessary to slit the opening forwards and backwards to the extent, in all, of about four inches.

With the opening thus enlarged, it was not an easy matter to get the bowel replaced, but the temptation to ease things by extending the wound was resisted. In enlarging the wound some distended blood vessels were divided, and rather free haemorrhage obscured the field; eventually this was cleared sufficiently to give a good view.

The peritoneum had receded and the tendinous portion of abdominal muscle could be seen plainly. These were left alone. For speed, the overlying oblique muscle was drawn together with a continuous suture, using No. 12 silk, and on account of the possibility of sinus trouble later the end of the suture was left to hang outside the wound. A continuous suture of ¾-inch tape was used for the skin and subcutaneous structures, and tightly laced.

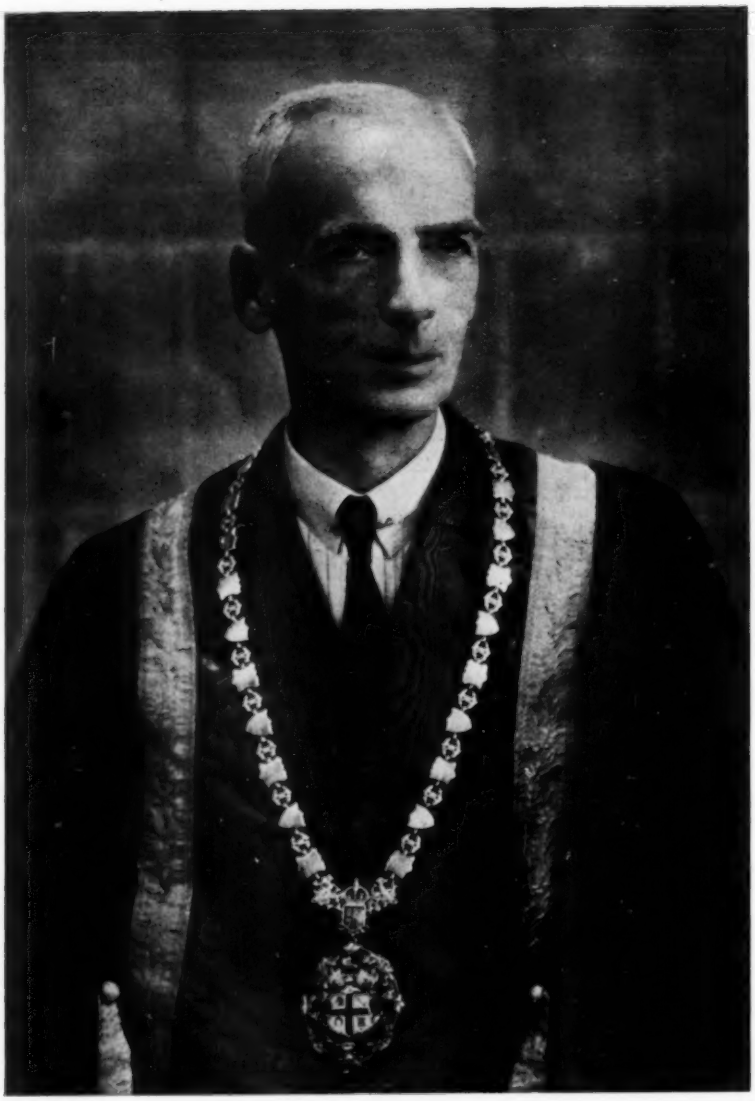
The ropes were released and the mare got up half an hour afterwards. She was returned to her box and the foal withdrawn. Water and very little bulky food were allowed. When seen 36 hours later there was a reaction in pulse and a slight rise in temperature. Swelling and oedema was marked, in fact forming, as it were, a cushion around the wound, which remained healthy without discharge. The patient had taken any food offered, walked and turned well and her progress was considered very satisfactory. At least an hour's walking exercise was ordered daily, and on the fourth day, all being well, she was to be let out daily on a bare pasture. On the eighth day, the mare having been put out to pasture full time, the swelling and oedema had practically gone and the wound was found to be dry and healthy. On the twelfth day the tape, which commenced to show traces of pus along its track, was removed. The wound was found to be firmly sealed except in one corner, where the owner was instructed to draw gently every day on the hanging end of silk, which pulled out three days later. By this time healing was complete without any complications, local or otherwise.

Remarks.—Staking in horses in the hunting field and in those running on pasture with indifferent fences is common in regions other than the abdomen, while staking with prolapse of bowel is rather rare. It would be fair to say that it would be an easy matter to count one's cases of the latter in a lifetime. It is for that reason that this case is recorded.

It is true there are disastrous cases with so much bowel exposed and injured beyond surgical aid that their destruction is inevitable. Similarly there must be cases where an owner wisely decides upon this course without summoning our advice or aid.

However, it has been my experience that *the abdomen of the horse is tolerant to manipulation* when dealing with breaches such

(Concluded at foot of previous column)



[*A. Winter: Preston*

ARTHUR BOWMAN MATTINSON, O.B.E., M.C., M.A. (MANC.), F.R.C.V.S., D.V.S.M. (VICT.)

President, Royal College of Veterinary Surgeons, 1945-46

MAJOR ARTHUR BOWMAN MATTINSON

O.B.E., M.C., M.A. (Manc.), F.R.C.V.S., D.V.S.M. (Vict.)

President of the Royal College of Veterinary Surgeons, 1945-46

In order that the members of the profession at home and overseas may have an insight into the past and present activities of their President, it is customary for *The Veterinary Record* to publish a short biographical sketch. Major Mattinson's veterinary life may well be divided into three phases, academic, military and civilian.

His academic attainments and work started when he qualified from the New College, Edinburgh, in December, 1902. In 1910 he gained a Fellowship Diploma with a Thesis on the Eradication of Bovine Tuberculosis, and in 1911 he took the Diploma of Veterinary State Medicine at the University of Manchester with distinction.

He is a Master of Arts of the University of Manchester. In 1922, Major Mattinson was appointed to the Chair of Materia Medica and was Professor in charge of the Out-patients' Clinic at the Royal Veterinary College. He resigned from the Royal Veterinary College to take up an appointment as Lecturer in Systematic Veterinary Surgery and Obstetrics at the University of Liverpool. At Liverpool he also lectured on Horse Shoeing and Therapeutics. He was held in high esteem by his Liverpool students and since resigning recently he has been ever ready to help any of his former students when difficulties have arisen during the course of their private practice.

His military career started when he was still a student at Edinburgh, for in 1900 he joined the ranks of the Westmorland and Cumberland Yeomanry and saw service in South Africa during the Boer War until its termination. From 1911 to 1914 he was Veterinary Officer in charge of troops Western Command and was mobilised on August 5th, 1914, serving in the first world war until 1922. He was Veterinary Officer to the 29th Brigade R.F.A., 4th Division, and O.C. No. 4 Mobile Veterinary Section, the first to be organised as an advanced Veterinary Hospital. Later he was Assistant Director of Veterinary Services, 4th Division, and was selected in 1915 for special duty, advising and directing measures against outbreaks of epizootic diseases in Western mule depots. He organised, formed and commanded the Army School for Farriery and was later Officer Commanding Nos. 1 and 2 Veterinary Hospitals in the Aldershot Command. After the war he was Veterinary Officer in charge of the 1st Brigade R.A.M.R., and was engaged in remount purchasing in Ireland, 1921-22. He was appointed D.A.D.V.S. of the 55th (West Lancs) Division in 1924 on transfer from the Reserve of Officers to the T.A. During the war he was twice mentioned in Despatches and received the O.B.E. and the M.C.

After such a long and distinguished military career one would have expected Major Mattinson to have finally retired from military life, but during the present war he again donned uniform and became Platoon Commander in the Home Guard. Major Mattinson's allegiance to King and Country has indeed been great.

His civilian activities have been no less distinguished than his academic and military. After seeing practice in Liverpool and Southport he took over a practice in Preston which he extensively increased and carried on most successfully for a number of years amongst the farmers of one of the most extensive dairying districts in the country.

For many years he has been an L.V.I. of the Ministry of Agriculture and Fisheries, acting as Portal Inspector at Preston and Fleetwood. He is Lecturer on Veterinary Science in the Lancashire County Institute of Agriculture and Veterinary Surgeon in charge of the County Council farm and Lancashire County Constabulary Horses. He is this year's President of the Lancashire Veterinary Association.

What little spare time Major Mattinson can find he spends at his farm in close proximity to his residence at Bamber Bridge.

Major Mattinson has been a member of the Council of the Royal College since 1933 and has been Chairman of the Finance and General Purposes Committee. From 1918 to 1922 he was an Examiner in Stable Management and Shoeing. He, therefore, brings to the office of President a wide, varied and valuable experience.

Repeated small doses of plasma are more effective in controlling shock than one large injection.—*J.A.V.M.A.*

REVIEW

[**Veterinary Surgery Notes.** (Revised Edition: 1944.) E. R. Frank, B.S.A., D.V.M., M.S. Burgess Publishing Co., Minneapolis, Minnesota.]

The dearth of modern text-books on general veterinary surgery makes a book by an obviously experienced clinician extremely welcome. The title suggests that the book is more in the nature of reports of the author's own experiences than a text-book in the ordinary meaning of the phrase, which perhaps excuses some of the deficiencies apparent to the critical reader.

Dr. Frank states in the preface, "if the material seems dogmatic it is because the student must have a definite course charted for him. . . ." In spite of this statement it must be borne in mind that different operators develop different techniques according to their several abilities and we feel that the student should be given the widest views. It is therefore unfortunate that the author does not give a greater number of alternative methods.

The general arrangement of the book is good, making for easy revision as and when necessary. Much extraneous matter is omitted and the book is copiously illustrated with photographs taken in the field. It is unfortunate that the printing and paper are such that some of the illustrations are not well reproduced and the X-ray pictures are largely worthless. More schematic drawings would be of help to the student.

The chapters on restraint and lameness are excellent, but anaesthesia could be more fully dealt with and the section on neoplasms is somewhat sketchy. The author writes here solely from his own experiences, making no attempt at classification. A greater number of references and case reports, where personal experience was lacking, would have improved this section considerably.

There are only a few references to the use of the sulpha compounds, none to closed plaster treatment, and insufficient to the undesirable sequelae which may follow surgical interferences. One feels that the whole book could be improved by being more carefully written—in places the grammar is very bad—and many of the references to the illustrations contain no number and one is left wondering to what the text refers. Techniques and instruments could be described in much greater detail. We hope that future editions will make the book a valuable addition to veterinary literature.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Oct. 3rd.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 2.30 p.m.

Oct. 4th.—Annual Meeting of the Central Veterinary Society, Conway Hall, W.C.1, 2 p.m.

Oct. 11th.—Meeting of the South-Eastern Division, N.V.M.A., at Tonbrdge (Rugby Football Club, Avebury Avenue), 2.30 p.m.

Oct. 11th.—Meeting of the Dumfries and Galloway Division, N.V.M.A., at Carlisle (County Hotel), 11.45 a.m.

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PERSONAL

Award for Services in Italy and Burma.—Amongst the awards, recently announced, for gallant and distinguished services in Italy, is that of the O.B.E. to Lt.-Col. A. P. Macdonald, of the Royal Army Veterinary Corps.

The O.B.E. (military division) has been awarded to Captain Robert M'Crea (Royal Army Veterinary Corps), Strabane, for gallant and distinguished services in Burma.

Veterinarian's Bar to D.F.C.—The award has been announced of a Bar to the D.F.C. which, as intimated in our issue of March 17th, Flying Officer Richard Lestocq Wooldridge, of No. 149 Squadron, R.A.F.V.R., gained for his outstanding courage as a navigator in operations directed against most of the principal targets in Germany.

Birth.—Wharrier.—At the Gables, Newcastle-upon-Tyne, on September 12th, 1945, to Dorothy (*née* Wurl), wife of John Wharrier, M.R.C.V.S., a son—brother for Carol Joyce.

Marriage.—Wilde—Cockerill.—On Monday, September 24th, 1945, by the Rev. T. M. Archer, M.A., at the Church of St. John, Abbeydale, Jack Kenneth Hillary Wilde, B.Sc., M.R.C.V.S., A.R.C.S. (Colonial Veterinary Service), only son of Mr. and Mrs. J. H. Wilde, of Totley Road, Sheffield, to Kathleen Elizabeth, youngest daughter of Mr. and Mrs. R. W. Cockerill, of Robin Hood's Bay, Yorkshire.

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R.C.V.S. OBITUARY

Bell, George J., 19, Sandymount Road, Dublin. Graduated Dublin July 23rd, 1906. Died September 10th, 1945.

Howard, Edmund Castle, Capt. N.Z.V.C., 163, Featherston Street, Palmerston North, New Zealand. Graduated Edinburgh May 20th, 1908. Died September 1st, 1945.

Kerr, Finlay, 24, Longford Terrace, Monkstown, Co. Dublin. Graduated Glasgow July 15th, 1884. Died September 13th, 1945.

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GENERAL OBITUARY

Professor Ernest Shearer

We regret to record the death of Professor Ernest Shearer, who retired in 1943 from the posts of Professor of Agriculture in the University of Edinburgh and Principal of the Edinburgh and East of Scotland College of Agriculture. He had been Principal of the College since 1924, and University Professor of Agriculture since 1926, when the posts were combined with a view to a more intimate relationship between the two departments. He was 66 years of age.

A native of Orkney, Professor Shearer was born and brought up on a farm. He graduated at Edinburgh M.A. with Honours in Economic Science and B.Sc. (Agri.). On leaving the University he received an appointment as Imperial Agriculturist to the Indian Agricultural Service, and five years later he was promoted Assistant Inspector General of Agriculture in India.

In 1911 he was appointed Principal of the Giza Higher College of Agriculture under the Egyptian Government, and in addition to his duties as Principal of the College he was responsible for the general direction of the three Government Intermediate Schools of Agriculture and of eight special farm schools. From 1919 until his appointment as Principal of the Edinburgh and East of Scotland College of Agriculture in 1924 he was Chief Technical Official in the Egyptian Ministry of Agriculture, being responsible for the direction and administration of the whole technical work of the Ministry.

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ADDRESSES OF DISEASE-INFECTED PREMISES

Foot-and-Mouth Disease:

Hunts.—Hemingford Grey Mill, Hemingford Grey (Sept. 20th).

Swine Fever:

Berks.—Red Cow Allotments, Caversham, Reading (Sept. 22nd).

Bucks.—Lockwood Farm, Wooburn Common, High Wycombe (Sept. 22nd).

Cornwall.—Tregender Vean, Ludgvan, Penzance (Sept. 21st); Park Farm, Delabole, Bodmin (Sept. 22nd).

Glos.—Harrow Hill, Drybrook (Sept. 18th); The Lodge, High Beech, The Pludds, Ruardean; The Bungalow, Harrow Hill, Drybrook; Edge Hills, Littledean, Cinderford (Sept. 20th); Court Field View, The Reddings, Lydbrook (Sept. 21st); Old Painswick Road, Gloucester (Sept. 22nd).

Hunts.—Herne Road, Ramsey St. Mary's (Sept. 18th).

Lincs.—35, Holding, Petts Lane, Sutton Bridge, Spalding (Sept. 18th).

Midlothian.—Hill View, Gilmerton, Edinburgh (Sept. 18th).

Northants.—Chase Park Farm, Yardley Hastings; Redshanks Farm, Farcet Fen, Peterborough (Sept. 18th); Claygate Farm, ditto (Sept. 20th).

Surrey.—Rear of Old Mill, Kingston Road, Ewell (Sept. 19th).

Yorks.—Piggeries at Garage, Great North Road, Middlefield, Leeds (Sept. 19th); Benningholme Hall, Benningholme, Beverley (Sept. 20th).

Sheep Scab:

Derbyshire.—Overstones Farm and Greenwood Farm, Hathersage (Sept. 17th); Torside Moor, Glossop (Sept. 19th); Carr House Farm, Hope; Two Thorn Fields Farm, Upper House Farm, Crookhill Farm, Alport Castles Farm, Ashopton; North Lees Hall Farm, Hathersage; Howden Moor, Old House Farm (two outbreaks), Ronksley Moor, Derwent; Higher Fulwood Farm and Twitchill Farm, Hope; Barber Booth Farm and Lady Booth Farm, Edale; Heyridge Farm, Rowlee Farm, Blagden View and Lockerbrook, Ashopton; Highlow Hall Farm, Hathersage (Sept. 21st).

Yorks.—Wymingbrook Farm, Redmires, Sheffield (Sept. 21st).

TUBERCULOSIS OF BOVINE ORIGIN

Tuberculosis of bovine origin is to be investigated (says the *Irish Press*) by experts appointed by the Department of Local Government in order to develop the most efficient counter-measures against the transmission of the disease from animals to man. The research will be carried out by two whole-time veterinary officers, Messrs. M. Cronin and B. Farrelly, M.S.R.C.V.S., who have been appointed by the Medical Research Council.

The Council has also arranged that Professor W. Kearney, M.R.C.V.S., Head of the Pathology Department, Veterinary College, Ballsbridge, will direct the work which will be carried on under his guidance in that Institution.

Dr. Ward, Parliamentary Secretary to the Minister for Local Government and Public Health, has circularised local authorities so as to arrange for the collection of material by the medical officers in charge of tuberculosis schemes throughout the country, and has also authorised the Tuberculosis Medical Officers to supply clinical information on the material collected, which will be essential to the success of the investigation

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PARLIAMENTARY PROCEDURE

The Government's proposals for the amendment of House of Commons' procedure to quicken the passage of legislation were published last week in minutes of evidence given before the Select Committee on Procedure.

This scheme—originally drafted by a Committee of Coalition Ministers—has been submitted to the Select Committee for their consideration. The main proposals are that more Bills, including those hitherto regarded as "the great measures of the Session," should be referred to Standing Committees; that the number and working hours of these Committees should be increased; and that whenever the Government may think it necessary the proceedings of these Committees should be subject to a time-table imposed by a guillotine resolution of the House. It is also proposed that if any congestion of work occurs in Standing Committees, the House itself should adjourn immediately after questions on a certain number of days to enable the Standing Committees to sit in the afternoon as well as in the morning.

* * * * *

FOOT-AND-MOUTH DISEASE

"During the past three months, June, July and August, 24 outbreaks of foot-and-mouth disease have occurred in Great Britain," states the Ministry of Agriculture in its News Service, and continues: "Enquiries to ascertain the origins of these outbreaks have shown that apart from outbreaks caused by the local spread of infection, swill or waste foodstuff from canteens, camps or private households is still responsible for the majority of the outbreaks in this country. In five instances the disease has been attributed to infection carried by those materials while in two instances the outbreaks were due to causes which it has not been possible to determine. The remaining 17 outbreaks were due to the spread of infection from other outbreaks in this country. Surrey was the most seriously affected area during the period in question, 16 of the outbreaks having occurred in that county."

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EXPORT OF BLOODSTOCK: FREIGHT CHARGES HANDICAP

On September 19th *The Times* published a letter from Lord Rosebery, President of the Thoroughbred Breeders' Association, the text of which was as follows:—

"Last week at Newmarket there was a record sale of thoroughbred yearlings amounting to over £560,000 in the aggregate. It is of interest to note, at this time when our export trade means so much, that nearly 30 per cent. of the money expended came from outside Great Britain. An analysis of the sale will show that this sum was expended almost entirely on the more expensive yearlings.

"There is a great demand for the cheaper type of bloodstock abroad, but this cannot be met while the Government keep the freights at such a high level. I myself have had letters from Australia and New Zealand and South America pointing this out. This applies not only to thoroughbreds but also to all livestock. To take an instance, it cost over £300 to export a bull to New Zealand this year which was bought at public auction for less than that sum. If the freights could be lowered our export trade would be largely increased.

"The success of the sales at Newmarket shows how right the Jockey Club was to keep up a certain measure of racing throughout

the war in spite of every sort of difficulty. Racing is the acid test of breeding, and without racing these animals would have had little value."

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H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office.

	Price net	*Post free*
COMMAND PAPERS (Session 1945-46):		
(6679) Civil Service. The Scientific Civil Service. Reorganisation and Recruitment during the Reconstruction Period	0 3	0 4
(6680) Civil Service. The Administrative Class of the Civil Service	0 1	0 2
SCIENTIFIC AND INDUSTRIAL RESEARCH, DEPARTMENT OF:		
Research Workers: Notes on Grants awarded by the Department of Scientific and Industrial Research to Research Workers and Students ...	0 2	0 3

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INTERNATIONAL FOOD AND AGRICULTURE COMMISSION

It is announced that the International Food and Agriculture Commission, which forms the first organisation emerging from the Hot Springs proposals of 1943, will hold its initial sitting in Canada on October 16th. More than 20 nations, the minimum required to set up this Food and Agriculture organisation, have now accepted the constitution and will send official delegates. Several other Governments are expected to do so before the conference assembles.

F.A.O. will be the first of the new permanent international organisations to come into existence. By its constitution the nations joining the organisation are "determined to promote the common welfare" through national and international action. The objectives are to improve efficiency in production and distribution, to raise levels of nutrition and standards of living, to better the conditions of the rural population; and to contribute by these means towards an expanding world economy. The member nations agree to report to one another on the measures taken and the progress achieved.

F.A.O. will link agricultural science with the modern science of nutrition and will collect and disseminate a wide range of statistics. It will be expected to act as spokesman for both producers and consumers in international councils.

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TOXICITY OF D.D.T.

Earlier abstracts have recorded research on the acute and chronic toxicity of D.D.T. More recently a long series of experiments has been carried out by Cameron and Burgess (*Brit. Med. J.*, 1945, **1**, 865) using a variety of laboratory animals and some human volunteers. Toxic effects and fatal doses were determined in rats, guinea-pigs and rabbits, D.D.T. being administered by various routes, in single or repeated doses, and dissolved in a number of solvents. Both crude and pure samples of D.D.T. were employed. Human experiments were chiefly confined to the wearing of garments and underclothes impregnated with the insecticide. As reported earlier, D.D.T. poisoning is characterised by nervous symptoms and the development of severe damage to the liver, and the authors conclude that there is no reason to anticipate any danger to man, provided a maximum concentration of 0·5 per cent. D.D.T. be insisted upon for sprays. Animal tests made it clear that there is a wide margin of safety in its use as an insecticide. Men handling higher concentrations should take precautions against skin contamination, and ample warning of the approach to toxic levels will be given in the form of anorexia, muscular weakness and fine tremors. In these experiments, prolonged contact with undergarments impregnated with D.D.T. did not produce any local or general disturbance in human subjects.—*Pharm. J.*

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PIG CLUB MOVEMENT

The continued progress of the Pig Club Movement was referred to by the Chairman of the Small Pig Keepers' Council, Mr. Cedric Drewe, M.P. (Honiton, Devon), at the Annual General Meeting of the Council held in London.

The Council's report revealed that there were 5,000 active clubs, which presented an increase of 119 on the previous year. Mr. Drewe said that the fact that the movement continued to grow during the sixth year of war was a tribute to its usefulness. More than 130,000 members of clubs were fattening pigs at the rate of 350,000 a year and were doing so largely on edible waste which would not otherwise be used. 86 per cent. of the pigs belonged to individuals and the remaining 14 per cent. to co-operative clubs. Pig owners' clubs were still the backbone of the movement, though co-operative clubs—specially those attached to schools and factories and those for miners—were doing a most useful job in using up waste on the spot.

Mr. Drewe, who was reappointed chairman of the Council, paid a warm tribute to pig club secretaries who, he said, had rendered a most valuable service not only to the movement but also to the country.

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AGRICULTURAL DEVELOPMENT OF BENGAL

A five-year plan for the economic, social and educational advancement of Bengal, estimated to cost 159 crores of rupees, was announced last week by the Provincial Government. The plan is the first instalment of a 20-year project involving an ultimate net outlay of 250 crores of rupees in capital and 31 crores in recurrent expenditure. The plan, which concentrates on agriculture, envisages the liquidation of the permanent settlement, which is generally regarded as having blighted the economic progress of Bengal. Comprehensive irrigation and drainage schemes are proposed and the reclamation in central and western Bengal of 400,000 acres of eroded land, which will be farmed collectively to facilitate the use of machinery. Other proposals include a chain of plant research stations, seed multiplication farms, and livestock breeding stations. There will be veterinary dispensaries in every *Thana* and peripatetic staffs to bring veterinary services to the villager's door.

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USE OF TREES AND SHRUBS AS FOOD FOR CATTLE

"In many parts of the British Empire, the feeding of excessive numbers of low-grade stock has become a serious problem, not only for the forester but also for the agriculturalist," states *Nature* as an introduction to its abstract of an article in the *Indian Forester* (Civ. and Milit. Gazette, Lahore, December, 1944), in which J. A. Wilson, of the Madras Forest Service, discusses the place of fodder from trees and shrubs in the "Agricultural and Forestry Economy of Madras."

Pointing out that this is a problem to which many of the newly founded soil conservation committees in the Colonies and elsewhere will have to give serious consideration, the abstract proceeds:—

"It has been the practice in India in the hot weather season and during serious famines to look to the forest for fodder for the villagers' often large herds of a very low type of cattle; the animals browsing on the trees, shrubs and young regeneration. 'In common with the rest of India,' Mr. Wilson writes, 'the cattle population of Madras is excessive; especially is this so in dry areas and areas of reserved forest, where cattle of low efficiency and little value can eke out a living at extremely low cost. . . . The concentration of scrub cattle in such areas, combined with the extension of agriculture to absorb waste lands, previously at the disposal of the cattle, has resulted in the complete denudation of grass cover over vast areas, except during the relatively short monsoon period. In the reserved forest of the dry districts also, the pressure of the grazing animals is high, and marginal areas are for the most part badly overgrazed. While the agriculturalist provides for his utility animals during the hot weather he cannot afford to do so for his scrub animals. From February onwards, therefore, they have to depend on whatever cheap fodder they can pick up.' From March onwards trees and shrubs put on new foliage, and the forest by the dual acts of browsing and lopping has to suffer to keep this low-grade stock alive.

"It has long been the aim and the policy of the forest officer in India to bring to an end this gradual degradation and impoverishment of the forests, annually overgrazed under more or less direct orders from the civil Government. The necessity, in the economic gain, for this long-continued practice is now being called in question, and not in India alone. More up-to-date management of the cattle is being considered, based on a sound soil and water conservation policy in all dry districts; improved pasture management over extensive areas of grazing grounds, involving a limitation of the head of cattle using the area and rotational closing; the storing of surplus monsoon fodder in hayricks and barns or by the preparation of ensilage. . . ."

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FOLIC ACID AND ANIMAL TUMOURS

One of the most recently discovered members of the vitamin B complex is folic acid, so called because it occurs in green leaves. It is acidic in nature and has a molecular weight of about 500, though the substance has not yet been identified chemically. Much of its chemistry has been worked out (*J. Amer. Chem.*

Soc., 1944, **66**, 271), but most of the experimental work on animals has been done with concentrates containing the substance. Folic acid has a powerful growth-stimulating action on normal cells, but inhibits tumour growth. It has been reported (*Science*, 1945, **101**, 46) that complete regression of breast cancer in mice occurred in 43 per cent. of the affected animals treated daily with 5 mgm. of folic acid. No tumours regressed among control mice not treated with folic acid.

The anti-anaemic properties of liver concentrates for the chick have been recognised for some years, and the active principle in liver has now been identified with folic acid (*Science*, 1943, **97**, 404). It is suggested that folic acid probably acts by stimulating the bone marrow rather than by directly inhibiting sulphonamides in anaemic rats fed on purified diets containing these drugs (*Brit. Med. J.*, 1945, **2**, 91). There is no evidence yet that it has an effect on human tumour growth, and work is proceeding.—*Pharm. J.*

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While engaged in practice bombing in Lincolnshire an aircraft dropped a bomb and a bullock was killed. A firm of fellmongers were asked to remove the animal. When the hide was removed and the animal cut up the practice bomb—a live one—was found inside the bull.

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The Shorthorn Society recently announced a new membership record of 4,540, while 200 applicants are awaiting election. During the last year 900 new members have joined.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal views of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.

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WELSH VETERINARY TRAINING

Sir,—It appears to me ridiculous to conclude that because there is a Medical School at Cardiff, then that is the place to establish a Welsh Veterinary College. Cardiff is as remote from North Wales as Bristol, so that should a Veterinary College be established there, students from North Wales would derive no benefit, Liverpool still being by far the most convenient. Medical students from North Wales attend Liverpool Medical School, and not the Welsh University Medical School at Cardiff.

I am fully aware that Wales is in serious need of a Veterinary School of its own, but if "Wales is a geographical, social and agricultural entity with special characteristics dissimilar from those across the border which require specialised and separate treatment," then, considering the geographical characteristics alone, Cardiff is not the centre for veterinary training.

Aberystwyth is situated in mid-Wales, and has a budding Animal Health Research Centre, which will tackle problems relating to animal health in Wales. There is also a School of Agriculture, and I believe that agricultural subjects bear a closer relation to veterinary science than does human medicine. Surely Aberystwyth is the obvious centre at which to establish a Welsh Veterinary Faculty.

Yours faithfully,

94, Penrhos Road, Bangor. C. M. Edwards.
September 17th, 1945.

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PET SHOP SALES: A SUGGESTION

Sir,—May I encroach on your valuable space to make a suggestion to members of the profession?

It is pitiful to see the condition in which animals are presented from some of the dog shops and some of the breeders. Rickets, diarrhoea, vomiting and beta-haemolytic streptococcal infections are abounding. The skins are either covered with lice or flea-ridden.

In only a very few cases does treatment yield results and the owners have no possibility of redress against the vendor as, mostly unknown to them, these shops disclaim any responsibility after the animals have left the premises.

May I suggest that through a collective effort of our profession a warranty is put on the sale of small animals as it is in large stock:—

(1) Each animal has to be properly weaned and I suggest a minimum of ten weeks with the mother.

(2) The sales premises should be open to inspection by members of the profession or inspectors of the R.S.P.C.A. without a complaint having been received by the R.S.P.C.A.

(3) The animals should be free from skin infections and other sicknesses at the time of sale.

Where a breach of warranty occurs the vendor should be bound to return the money—without exchanging the animal against another one for a slightly reduced extra payment. This may protect the purchaser from "being sold a pup."

Yours faithfully,

91, Watford Way, Hendon, London, N.W.4. E. von Lustig-Lendva.
September 11th, 1945.

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VETERINARY EDUCATION

Sir,—I wish to correct a mis-statement in your last issue. Dr. W. R. Wooldridge writes, "I think it only right that your readers should know that the Council, R.C.V.S., did not consciously supersede him 'in the interests of progress,' for Mr. Smythe himself withdrew from his appointment at the time of excessive air raids and travel difficulties." Knowing how distressed Dr. Wooldridge would be if it were thought that he had misrepresented the facts, I hasten to his aid. The truth is that I was balloted out by the Council, R.C.V.S., quite justly, in favour of an excellent and tried examiner, for whom I had the greatest admiration. Unfortunately, this gentleman died shortly before the date of the examination and I was asked at a few days' notice to officiate in his place. Having made no arrangements to carry on my practice I was forced to decline. There was never any mention of air raids or travel difficulties.

I regret also that Dr. Wooldridge should accuse me of exaggeration in my statement that examiners were in the *closest* touch with the teaching staffs. The latter will be the first to confirm my statement if Dr. Wooldridge will communicate with them. It appears that Dr. Wooldridge is also a little illogical in bewailing the possibility of a variable standard of examination at the various centres under present conditions when in almost the same breath he suggests that under the suggested arrangements busy practitioners might offer themselves for shorter periods as examiners at *one or the other* universities.

Yours faithfully,

Veterinary Infirmary, 45, St. James's Street, Nottingham. R. H. Smythe.
September 22nd, 1945.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
August 16th to 31st, 1945 ...	7	—	—	1	43
Corresponding period in—					
1944 ...	4	18	—	5	117
1943 ...	9	—	—	5	24
1942 ...	16	144	—	5	18
Total Jan. 1st to Aug. 31st, 1945	78	101	6	49	659
Corresponding period in—					
1944 ...	127	63	6	67	724
1943 ...	197	12	6	110	357
1942 ...	226	347	26	123	298

Note.—The figures for the current year are approximate only.
*** Excluding outbreaks in Army Horses.**

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at August 31st, 1945, was as follows:—

England	Wales	Scotland	Total (Great Britain)
5,004	8,914	5,190	19,108